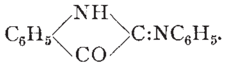
A NEW SYNTHESIS OF INDIGO.

AN important new synthesis of indigo is described by Dr. T. Sandmeyer in the April number of the *Zeitschrift für Farben- und Textil-Chemie*. The starting point for the synthesis is thiocarbanilid, $CS(NH.C_6H_5)_2$, which is converted in one operation by the simultaneous action of white lead and potassium cyanide into the hydrocyanide, $C_6H_5.N:C(CN).NH.C_6H_5$, of carbodiphenylimide. This compound is changed by the action of yellow ammonium sulphide into the thioamide,

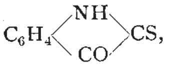
$$C_6H_5.N:C(CS.NH_2).NH.C_6H_5,$$

which, when stirred into warm sulphuric acid, undergoes condensation, and yields an α-isatinanilide,



$$C_6H_5\Big\langle\begin{array}{c}NH\\CO\end{array}\Big\rangle C:NC_6H_5.$$

The anilide is converted directly into indigo when dissolved in alcohol and reduced with ammonium sulphide, but the indigo separates in glistening crystals which cannot easily be reduced by the ordinary methods, and so is unsuitable for commercial use. A better method, and one which renders it unnecessary to separate the isatinanilide from the sulphuric acid used in its preparation, consists in allowing the acid solution to flow into ice-water simultaneously with a solution of sodium sulphide, when the anilide is converted into thioisatin,



$$C_6H_4\Big\langle\begin{array}{c}NH\\CO\end{array}\Big\rangle CS,$$

which is thrown down as a bulky precipitate. In order to prepare the indigo it is now only necessary to make the precipitate into a thin paste and mix it with a little alkali, when the thioisatin rapidly decomposes into indigo and sulphur. The sulphur is removed by extracting with carbon disulphide, and the indigo is left in the form of light, dark-blue blocks, which readily crumble when rubbed between the fingers, and can be made into a uniform paste which is easily reduced to indigo-white. The patents are held and are being worked by J. R. Geigny, of Basle, and the process may prove to be a formidable rival not only to natural indigo, but also to the synthetical process employed by the Badische Anilin- und Soda-Fabrik.

UNIVERSITY AND EDUCATIONAL INTELLIGENCE.

OXFORD.—The 249th meeting of the Junior Scientific Club was held on May 20. Mr. H. S. Souttar gave an exhibit of an automatic method of drawing capillary tubes intended for use in the capillary electrometer. Mr. S. A. Ionides read a paper on "Mining in Cornwall," in which he gave an account of the methods employed for raising and washing the tin ores.

CAMBRIDGE.—Mr. Andrew Graham, who has for nearly forty years held the office of chief assistant at the observatory, and is known to astronomers as the discoverer of *Metis*, is retiring at the age of eighty-eight. It is proposed to assign him a pension of 200*l*. a year.

The use of the Senate House has been granted to the local committee of the British Association for the meeting to be held in Cambridge next year.

LORD KELVIN and Lord Lister are to receive the honorary degrees of doctor of science from the University of Wales next November.

MR. W. M. CHILDS, vice-principal of University College, Reading, has been elected principal of the College in succession to Mr. H. J. Mackinder, who resigns office in September next.

IT is stated by the *Electrician* that a donation of nearly 40,000*l*. has been promised by Lord Iveagh to Trinity College, Dublin, with the object of building and equipping scientific laboratories.

THE Liverpool University Bill was, on Tuesday, reported for third reading by Lord Morley, Chairman of Committees of the House of Lords. The object of the Bill is to separate University College, Liverpool, from the Victoria University, and to merge it into the University of Liverpool.

THE annual report of the Royal Agricultural Society, which was adopted at the general meeting held on May 22, states that with the view of bringing before the public the general characteristics of the teaching now provided at agricultural colleges, and of directing attention to the Society's own share in this work as a national examining body, the council has decided to organise an agricultural education exhibition as a new feature of its annual show.

IN his recent paper read at a meeting of the Society of Arts Mr. G. T. Morrison gave a clear and useful account of the modern methods of construction of maps and charts. His descriptions of orthographic, stereographic, Mercator's, gnomonic and elliptical projections should prove of great assistance to teachers who wish to explain the methods employed to make maps, which either give good general ideas of the appearance of the whole or of parts of the earth, or retain some one property of the sphere at the expense of disregarding the others. Mr. Morrison thinks that for the purpose of teaching geography a projection based, not on any distinct mathematical rule, but on a system of compromise, is on the whole the best—one, for example, on which the meridians and parallels are spaced at equal distances throughout.

ARRANGEMENTS have been made for an allied colonial universities dinner and conference to be held early in July. The conference will be held on July 9 at the rooms of the Royal Society, Burlington House (by permission of the president), to discuss the question of the coordination of university education throughout the King's dominions, and the development of post-graduate courses in applied science. It is expected that an Imperial council will be formed to deal permanently with these interests. The dinner will be held on Friday, July 10, at the Hotel Cecil. The Lord Chancellor and other statesmen, many high public officials, representatives of colleges and universities in the United Kingdom and the colonies, and several distinguished men of science are expected to be present. Graduates and undergraduates of colonial universities wishing to attend the dinner, or to take part in the conference, are requested to write as soon as possible to Mr. C. Kinloch Cooke, hon. sec., 3 Mount Street, London, W.

THE annual catalogue, 1902–3, of the Massachusetts Institute of Technology at Boston gives very full particulars of the numerous courses of instruction in connection with the institute, a clear plan of the extensive buildings, a register of graduates, and other interesting details. The tuition fee for regular students is 50*l*. per annum, for half a year or any shorter period the fee is 30*l*. Special students pay, in general, the full fee; but when a few branches only are pursued and the time required for instruction is limited, applications for a reduction in the fees are considered. Regular students whose financial necessities are such as to prevent their continuance at the institute are encouraged to apply for aid to the scholarship committee of the faculty. Students may conveniently live in any of the nearer cities or towns, since the hours of the institute are from 9 to 5. The cost of board and rooms in Boston and the neighbouring towns need not exceed from thirty shillings to two pounds a week. The cost of books and material varies from five to seven pounds a year.

THE second clause of the London Education Bill, referring to the constitution of the education committee was withdrawn by the Government on Monday. In its original form the Bill provided for the appointment of thirty-one representatives of the borough councils upon the committee. This number was reduced to twelve in Committee of the House of Commons last week, but the compromise pleased nobody, so the whole clause, with its restrictions upon the local authority with regard to the constitution of the Education Committee, has been omitted from the Bill. By this action the London County Council, so far as the constitution of its education committee is concerned, is placed in precisely the same position as other local authorities brought into being by the Act of last year. The Council will frame a scheme for itself, just as other county councils have done, or are doing, and under the same conditions.

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On Tuesday the Bill passed through Committee, but the third clause was greatly modified. In its altered form the clause provides for a body or bodies of management in each borough, constituted so as to include one-fourth members nominated by the County Council, and three-fourths by the borough council. The measure, as passed, does not include the clause giving the borough councils the power of appointing and dismissing teachers.

SCIENTIFIC SERIALS.

Transactions of the American Mathematical Society, vol. iv. No. 2 (April).—G. H. Darwin, approximate determination of the form of Maclaurin's spheroid.—H. S. White, on twisted cubics that have a directrix.—L. Heffter, line-integrals in n-dimensional space.—E. Kasner, the generalised Beltrami problem concerning geodesic representation.—G. A. Miller, on the holomorph of a cyclic group.—J. L. Coolidge, quadric surfaces in hyperbolic space.—A. Loewy, on the reducibility of real groups of linear homogeneous substitutions.—W. B. Ford, on the possibility of differentiating term by term the developments of an arbitrary function of one real variable in terms of Bessel functions.—E. J. Wilczynski, on a certain congruence associated with a given ruled surface.—J. Westlund, on the class-number of the cyclotomic field $k(e^{2\pi i/p^n})$.

Bulletin of the American Mathematical Society (2) vol. ix. No. 8 (May).—E. H. Moore, presidential address on the foundations of mathematics.—C. J. Keyser, concerning the axiom of infinity and mathematical induction.—E. R. Hedrick, review of R. Fricke's treatise on the differential and integral calculus.

SOCIETIES AND ACADEMIES.

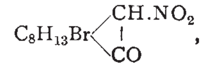
LONDON.

Royal Society, May 7.—"Experiments in Hybridisation, with Special Reference to the Effect of Conditions on Dominance." By L. **Doncaster,** B.A., King's College, Cambridge. Communicated by Dr. S. F. Harmer, F.R.S.

Describes experiments on hybrid Echinoid larvæ, made to determine whether the dominance of a character is influenced by the condition of the genital cells at the time of fertilisation. It is concluded that there is no evidence that this is the case, and that the seasonal changes observed in the larvæ are due to difference in temperature.

May 14.—"A New Class of Organo-Tin Compounds containing Halogens." By William J. **Pope,** F.R.S., Professor of Chemistry, Municipal School, Manchester, and Stanley J. **Peachey.**

Chemical Society, May 7.—Prof. H. McLeod, F.R.S., vice-president, in the chair.—It was announced that the council at its meeting that day had awarded the Longstaff medal to Prof. W. J. **Pope,** F.R.S., for his researches on the stereochemistry of compounds of elements other than carbon.—The following papers were read:—The action of ammonia and organic bases on ethyl esters of olefinedicarboxylic and olefine-β-ketocarboxylic acids, part ii., by S. **Ruhemann.**—Spontaneous decomposition of nitrocamphor, by T. M. **Lowry.** A quantity of nitrocamphor, prepared in 1898 and purified by recrystallising once from alcohol, was found to have undergone spontaneous change into a sesquicamphorylhydroxylamine, identical with that prepared from camphoryl chloride and camphoryloxime.—β-Bromo-α'-nitrocamphor- and β- and π-bromocamphoryloximes. The influence of impurities in conditioning isomeric change, by T. M. **Lowry.** β-Bromo-α'-nitrocamphor exists in two forms; the *pseudo*-form,



$$\mathrm{C_8H_{13}Br}\left\langle\begin{array}{l}\mathrm{CH.NO_2}\\ \;\;|\\ \mathrm{CO}\end{array}\right. ,$$

separates from solutions of the nitro-compound in benzene or ethyl acetate. The normal form was not isolated. A mixture of the two forms, obtained by crystallising from hot alcohol or acetic acid, softened at 100°, melted without decomposition at about 114°, and remelted sharply at 100°; the latter is therefore the temperature at which the solid *pseudo*-form is in stable equilibrium with the liquid mixture. Freshly prepared solutions of β-bromo-α'-nitrocamphor exhibit the phenomenon of mutarotation. A solution in benzene of the *pseudo*-form is at first almost inactive, but in the course of two or three days the specific rotatory power becomes constant and equal to −80°. The change of rotatory power is not spontaneous, but is conditioned by the presence of traces of impurity. This fact shows that, even when both isomerides are present in solution, equilibrium between them is only established in presence of a trace of a catalytic agent, probably an alkali. These phenomena are closely analogous to Baker's observations on the union of hydrogen and oxygen, and are directly opposed to Laar's hypothesis of "tautomerism."—The electrolytic reduction of pheno- and naphtho-morpholones, by F. H. **Lees** and F. **Shedden.** Attempts were made by electrolytically reducing aromatic morpholones in sulphuric acid solution to produce aromatic morpholines possessing physiological properties similar to those of morphine; the morpholone ring, however, usually undergoes secondary decomposition.—The coloured constituents of *Butea frondosa,* by E. G. **Hill.** The dried and fresh flowers of *Butea frondosa,* used in India for the preparation of a somewhat fugitive yellow dye, contain fisetin and different anhydrides of a tannic acid.—Butein. A preliminary notice by (the late) J. J. **Hummel** and A. G. **Perkin.** Butein, the colouring matter of the flowers of *B. frondosa,* described by Hummel and Cavallo in 1894, probably exists in two modifications which, on fusion with alkali, give resorcinol and protocatechuic acid. The tinctorial properties of butein closely resemble those of benzylideneanhydroglycogallol, to which it is possibly allied.—The relative affinities of polybasic acids, by H. M. **Dawson.**—The chemical dynamics of the reactions between chlorine and benzene under the influence of different catalytic agents and of light, by A. **Slator.** With a large excess of the hydrocarbon, the relative amounts formed of the two chief products chlorobenzene and benzene hexachloride depend on the conditions of the experiment. The velocity of these reactions, especially under the influence of different catalytic agents, has been measured under various conditions. Under the influence of light without catalysts, the addition reaction alone occurs; under conditions of equal illumination, the velocity of this change is found to be proportional to the square of the chlorine concentration.—The diazo-reaction in the diphenyl series. Part i. On dianisidine and 3 : 3′-dichlorobenzidine, by J. C. **Cain.** On heating aqueous solutions of the diazonium salts prepared from dianisidine and 3 : 3′-dichlorobenzidine, dark-coloured, insoluble, infusible compounds which appear to be quinones are obtained instead of the expected dihydroxy-derivatives.

Linnean Society, April 16.—Rev. T. R. R. Stebbing, vice-president, in the chair.—Dr. G. **Henderson** exhibited a coloured sketch of a withered leaf of *Quercus incana,* Roxb., and of slugs found amongst the dead leaves. The drawing of the mollusc and leaf was to show their strange resemblance in colour and outline. These slugs are common at Dalhousie in the Punjab, on ground which is always covered with these withered leaves. A few black slugs were to be found with the light-brown specimens, and whilst the latter escaped the notice of birds, the former were taken.—On some points in connection with the ordinary development of Vaucheria resting-spores, by Dr. H. C. **Bastian,** F.R.S. In 1891 the author had some spores of Vaucheria under observation in a bottle loosely covered with a screw-cap, and after a few weeks these spores were found to be germinating and emitting filaments. In 1902 the experiments were repeated on *Vaucheria racemosa*; material was kept in a shallow dish, and a few days later the spores were transferred to a stoppered bottle; another portion was put into a tumbler, loosely covered to exclude dust. Within seven weeks the bottled specimens germinated, a process which did not take place in those in the tumbler for some time later. Special attention was drawn to the pigment-granules, to be regarded as refuse-products left over during the molecular transformation that the spore has undergone in becoming decolorised; they are heaps of fine granules, without any bounding membrane. These pigment-heaps pass into the filament as spheres with a sharply-defined outline, or else press together in compressed forms. Slight to-and-fro movements were detected in them. One pigment sphere

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